PROCEEDINGS OF THE
ROYAL ENTOMOLOGICAL SOCIETY
OF LONDON

SERIES C. JOURNAL OF MEETINGS

VOLUME 16. No. 2, 1951

ORDINARY MEETING

WEDNESDAY, 7TH MARCH, 1951, at 5.30 p.m.

AGENDA

1. Confirmation of the Proceedings of the Ordinary Meeting held on 7th February, 1951.
2. Recommendations of candidates for Fellowship.
3. Announcement of election of new Fellows.
4. Additions to the Library.

Presented.

Balfour-Browne, Frank. *British water beetles.* *Volume* 2. 8vo. London. 1950. [Ray Society Publication no. 134.] [The Ray Society.]

Berner, Lewis. *The mayflies of Florida.* 4to. Gainesville. 1950. [The Publishers.]

Fattig, P. W. ICHNEUMONIDAE or parasitic Hymenoptera of Georgia. *Emory Univ. Mus. Bull.* **9** : pp. 78. 1950. [The Author.]

Lepesme, P., *editor.* *Longicornia. Etudes et notes sur les Longicornes.* *Volume* 1. 8vo. Paris. 1950. [Dr. P. Lepesme.]

Viswanathan, D. K. *Malaria and its control in Bombay State.* 8vo. Poona. 1950. [The Author.]

Purchased.

Janse, A. J. T. *The moths of South Africa.* *Volume V, part* 2. GELECHIADAE. 8vo. Pretoria. 1950.

In addition separates were presented by Mr. L. Parmenter ; The Smithsonian Institution ; United States Department of Agriculture ; Dr. Ivar Trägårdh ; Mr. C. L. Collenette ; South African Institute for Medical Research, Johannesburg ; Anti-Locust Research Centre ; Mr. K. G. V. Smith ; Commonwealth Institute of Entomology ; Mr. M. Niblett and Mr. H. M. Edelsten.

5. Admission of Fellows.
6. Exhibits.

Fellows are particularly requested to bring suitable exhibits to the Meeting even though it may not be possible to announce their intention to do so beforehand.

> *Note.*—To avoid congestion in the Library and to enable exhibits to be displayed to greater advantage, a table has been placed in the meeting-room for this purpose. Fellows are asked to place their exhibits on this table, with a suitable explanatory note, as soon as possible on the afternoon of the meeting, so that they are available for inspection there before the meeting opens.

7. Communications.

Mr. C. R. Ribbands (a visitor).

The Effective Flight Range of the Honeybee.

[ABSTRACT]

Eckhert (1933) has recorded that honeybees will, if necessary, gather nectar from crops seven miles from their hives. Their usual flight range is believed to be less than this, but most authorities have agreed that it is 1 to 2 miles.

Honeybees are convenient for experiments upon flight range, because colonies can be moved about, and placed at definite distances from desirable crops. The effects of flying distance can then be estimated from changes in the weight of the colonies. Isolated crops are necessary for such experiments, and the chief selected were apple, lime and heather. These had the advantage that they are permanent crops, so that experiments could be repeated in successive years. Groups of colonies were placed at three apiary sites in relation to each crop—on the edge of it, and ⅜ and ¾ mile from that edge.

Eight experiments were conducted, and in all instances the colony gains were reduced as the flying distance was increased. The extent of this reduction varied very considerably, even on the same sites in successive years. At one extreme a distance of ⅜ mile appeared sufficient to eliminate all gain, while at the other extreme a distance of ¾ mile reduced the colony gain by only 14 per cent. The proportion of time spent in flying varied with the quality of the crop; in good honeyflows it could have an appreciable effect. Colonies further from their crop stopped flying earlier in the evening, but this difference was considered unimportant.

The biggest variations in the magnitude of the effect of distance were related to variations in weather conditions. Another factor of great importance was that the recorded net gains were the surplus left over after the requirements of each colony for immediate sustenance had been met. As these requirements were considerable and similar irrespective of distance from the crop, the effect of distance upon colony net gains was much greater than its effect upon the quantity of forage brought into the hive; in one instance a 99 per cent. loss of the on-crop gain, at ¾ mile, could have been produced by a 42 per cent. reduction in the amount of incoming forage.

The effective flight range for pollen-collecting can be expected to be much less than that for nectar-gathering. These results will be discussed in relation to problems of crop pollination, apiary siting and suburban and country beekeeping.

TEA will be served in the Library before the meeting.

A card index of Fellows' addresses arranged **on a geographical basis** is now available for the use of Fellows in the Society's Rooms. Addresses in Great Britain are grouped under counties; elsewhere under Dominions, Colonies, Foreign States, etc.

ADMISSION OF FELLOWS

Any Fellow who has not been formally admitted to the Society under Chapter XIV, Section 4 of the Bye-laws and attends the meeting on 7th March, 1951, is requested to inform the Secretary before 5.15 p.m. on that date.

Festival of Britain and IXth International Congress of Entomology, Amsterdam, 17th–24th August, 1951.

The Council of the Society wishes to assist entomologists from overseas who may be visiting England and Holland in connection with the above events. Visiting entomologists will be invited to use the Society's rooms, but, in addition, it is hoped that some Fellows will be able to offer personal hospitality.

Fellows who are able to offer such hospitality are invited to do so through the Society, by writing to the Secretary indicating whether their offer applies to (1) a particular entomologist, (2) a person interested in a particular branch of entomology, or (3) any visiting entomologist, and to add the nature of the hospitality available.

Invitations relating to the periods immediately before or after the Amsterdam Congress are likely to be of most value to visitors.

PROCEEDINGS OF THE ORDINARY MEETING HELD ON 7TH FEBRUARY, 1951.

Mr. N. D. Riley, President, in the Chair.

Present, 80 Fellows and 16 Visitors.

Before the meeting formally opened Mr. Riley expressed his appreciation of the honour Fellows had conferred upon him in electing him to the office of President.

The Minutes of the Ordinary Meeting held on 6th December, 1950, and of the Annual Meeting held on 17th January, 1951, were confirmed and signed by the President.

The President announced that he had appointed Dr. B. P. Uvarov, C.M.G., F.R.S., Professor G. C. Varley and Dr. V. B. Wigglesworth, C.B.E., F.R.S., as Vice-Presidents for the coming year.

The names of the following candidates for election were read for the first time: Mrs. B. R. Aspoas, J. R. Audy, C. L. Bell, C. S. H. Blathwayt, M.A., J. D. Bradley, P. J. Burton, J. D. Carthy, M.A., Ph.D., R. W. Crosskey, B.Sc., A.R.C.S., L. Davies, Ph.D., R. L. Edwards, Q. A. Geering, B.A., J. B. Gilpin-Brown, R. A. Harrison, H. Hurtig, J. R. Leigh, R. C. Muir, W. J. Perry, M.Sc., C. L. Remington, A.M., Ph.D., Eleanor H. Slifer and G. E. Stride.

For the second time (taken as read):

Guran Lal Arora, M.Sc., John Henry Burman, Hsiu-fu Chao, Nirmal Chandra Chatterji, M.Sc., Dr. Peter Fenjves, George Ronald Gradwell, B.A., Dr. R. L. Gupta, Professor Brian Hocking, The Rev. T. B. Kitchen, Chandy Kurian, M.Sc., F. H. Lees, J. R. Mair, I. W. Beresford Nye, S. N. Rao, M.Sc., D. J. W. Rose, F. N. Wright, B.A.

The Secretary read the names of the following newly elected Fellows of the Society: P. T. Haskell, 80, Greenwood Road, Mitcham Surrey; Ernest Lewis, 8, Parry Road, South Norwood, S.E.25; Col. N. MacNeill, M.R.I.A., Ordnance Survey, Phoenix Park, Dublin; J. P. Tunstall, 74, Old Road East, Gravesend, Kent.

Thanks were voted to donors of gifts to the Library since the last meeting.

Mr. M. W. R. de Vere Graham, Mr. E. Lewis, Mr. H. S. Robinson, Mr. J. P. Tunstall, and Mr. I. E. Whitehead signed the Obligation Book and were admitted Fellows of the Society.

Mr. R. L. E. Ford exhibited a series of *Nephopteryx similella* Zincken, taken in a mercury vapour trap, at Bexley at 1.30 a.m. during mid-June. Mr. R. F. Bretherton said he had also taken this species at Ottershaw at a mercury vapour lamp in a ground floor room.

Mr. E. W. Classey exhibited proofs of two coloured plates to be published in the *Entomologists' Gazette* showing two species of Macrolepidoptera, *Luceria virens* L., taken in the Burren district of County Clare, and *Diarsia florida* Schmidt, taken at Askham Bog, York, recently added to the British list. The specimens were taken at mercury vapour light.

Mr. H. S. Robinson gave a paper on the behaviour of night-flying insects in the neighbourhood of a bright source of light, an abstract of which appeared on p. 2. He summarized his talk as follows:

(1) The normal insect night flight over an area was modified by the introduction of a light source into the area in the following ways: (*a*) Repulsion caused the total flight into the area to be reduced; (*b*) dazzle caused a concentration of insects at the light source; (*c*) inhibition caused settling of a number of insects within the area.

(2) The areas over which repulsion and inhibition took place were governed by the power of the light source.

(3) The area over which dazzle took place was governed by the surface brilliance of the light source.

(4) The power and brilliance of lamps must, for purposes of comparison, be determined in the scale of insect vision.

(5) There was no evidence that any insects which would not have entered the area in their normal flight could be induced to do so by the introduction of a lamp of any known type.

In the discussion following Mr. Robinson's paper, Mr. Classey said his personal experience had confirmed the seemingly revolutionary theories put forward.

Dr. Wigglesworth, in commenting on the great value and interest of the paper, said that Mr. Robinson had arrived independently at the previously established conclusion that insects use a distant source of light (e.g. the moon) as a means of orientation. In the case of a near source the angle at which the light strikes the retina alters if the insect flies in a straight line, and when this is less than a right angle they converge in a logarithmic spiral; when the angle is greater than a right angle there is probably repulsion. The sensitivity of the retina varied in different species. He felt that the range of insect vision demonstrated by Mr. Robinson might be true for night-flying insects, but that in day-flying species the range was nearer to that of the human eye. Mr. Robinson pointed out that his sensitivity curve was, to some extent, a matter of conjecture and had only been experimentally established for the dazzle effect. It might well be that the curve for normal vision of night-flying insects was different and comparable with that for day-flying insects. The essential point was that normal night vision and " dazzle " were two separate phenomena.

In reply to an inquiry from Mr. Austin Richardson as to the power of lamp which was most successful, Mr. Robinson said a very small source of light at a high power was the objective, the most effective source yet used being a 500-watt high pressure mercury vapour lamp of special construction, giving 25,000 c.p. at a surface brilliance of about 100,000 lumens per sq. cm. For practical purposes, however, there was little to choose between an 80-watt or 120-watt mercury vapour lamp, either pearl or clear. He also said that the disadvantage of the Phillips blended lamp about which Mr. Richardson asked was that the filament acted as a lighted background and reduced the effective brightness of the lamp as a source of attraction.

Mr. Edelsten said that in his experience attraction or repulsion was considerably influenced by weather conditions, but Mr. Robinson said this factor in turn varied with different insects.

Mr. Ford mentioned from his own experience in the Ham Street Woods area that while the degree of success with mercury vapour lamps did vary, they never gave the really poor results that petrol lamps sometimes did.

Dr. van Emden commented that thirty or forty years ago insects seemed to come in greater numbers to lights in towns.

The President suggested that this was because carbon arc lights were then in use.

Mr. Bretherton inquired whether any work had been done on differential sensitivity to light in insects. This appeared to be very variable, certain species of GEOMETRIDAE being peculiarly insensitive to *all* lamps. Mr. Robinson said there was no evidence that species were " peculiarly insensitive " and that much might depend on the type of trap used. Thus, a species which approached but did not enter a trap based on the " attraction " principle might well be taken in one of the design described.

Dr. Gunn said he felt that mercury vapour lamps would be a useful means of investigating the light compass reaction discussed by Dr. Wigglesworth. The theory as applied to night-flying insects was analogous to the long-known use of the sun as a compass by ants. He hoped that experiments could be devised to determine whether the insects came in direct, or in a closing spiral, and it might be possible to carry out a combination of experiments with this trap and the Rothamsted suction trap. It would be interesting to catch a number of specimens, mark and release them, and see how many were re-caught ; this method could be used to indicate the distances from which the insects were coming to the light and also the proportion of insects which responded to the light. In economic control, light traps had produced disappointing results in reducing the populations.

Dr. Hickin inquired as to Mr. Robinson's experience with Caddis flies, normally well known to be attracted to light from great distances, he himself having taken a specimen of *Micropterna sequax* two miles from the nearest possible source of water. Mr. Robinson, while confirming that Caddis flies came in numbers to mercury vapour lamps, felt certain they were not attracted over such a distance as two miles, and Dr. Hickin's specimen must have been within fifty yards of the lamp.

Mr. Collenette said that in the tropics where certain species were associated with typical habitats, lamps were found to be attractive up to a distance at which they could throw a shadow.

Mr. Classey, referring to Dr. Hickin's remarks, said he quite believed that Caddis flies travelled great distances from water, and recalled the reference at a previous meeting (1948, *Proc. R. ent. Soc. Lond.* (C) **13** : 52) to males of the Chalk Hill Blue butterfly flying at great distances from their normal habitat, weather and wind also being factors which might operate.

Mr. M. W. R. de Vere Graham said that Caddis flies started to wander early on suitable evenings and were likely to travel considerable distances.

Mr. Oldroyd said he had watched with interest the activity of a blowfly in shuttling between two lights in a room. The light ceased to be attractive when the fly was near it, the other light then exercising the attraction. A small light against a dark background had the greatest directional attraction.

Professor Varley said he was puzzled by the theories advanced. Experiments with the winter moth showed that some night-flying insects had good vision and could see a tree trunk against the night sky. This being so, it was strange that such a very bright source of light should be necessary in a trap. If light compass reaction was the explanation, such a bright source of light should not be needed to produce the same effect.

Dr. Gunn suggested that it should be possible by marking with fluorescent paint, which would shine brightly in " black " light from a mercury vapour lamp, to follow the course of insects and see whether they came direct or in a spiral movement. The vertebrate eye was very different from an insect eye, and he was not happy about the idea that behaviour of insects towards lights was due to dazzle. The light compass reaction could be tested.

Dr. Salmon said that he had used a light trap extensively in the mountains of New Zealand and had noticed that while some insects approached in a spiral, many Noctuids, in particular, flew straight in to light from great distances. Weather had a profound effect and in his experience the best periods were eight hours before the onset of rain or 2–3 hours before the onset of fog.

Mr. E. S. Brown said that aquatic insects such as Corixids and water beetles were attracted to water surfaces from which only a limited amount of light was reflected at night. He enquired as to the amount of illumination required and the nature of the light emanating from these surfaces, and whether aquatic insects were specially sensitive to this type of light. Mr. Robinson, replying to Prof. Varley and Mr. Brown, said that two distinct points were involved. Insects did see normally and it was probable that they came to the water surface in this way. The point of the present discussion was that the effect of a powerful light was a disturbance of the balance of vision, as happened when the human eye was dazzled by the headlight of a car.

In thanking Mr. Robinson for his paper, the President said that he could not fail to be amazed by the tremendous catches (25,000 moths alone) in a single night mentioned by Mr. Robinson ; this only served to confirm the belief that the insect population was of astronomical proportions.

E. B. BRITTON, *Honorary Secretary.*

The next meeting will be held on 4th April, at 5.30 p.m.

Printed by Adlard and Son, Limited, Bartholomew Press, Dorking.